



**List of Courses Focus on Employability/ Entrepreneurship/
Skill Development**

Department : *Biotechnology*

Programme Name : *B.Sc.*

Academic Year : *2017-18*

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
1.	LBTC 201	MICROBIOLOGY
2.	LBTC 301	BIostatISTICS
3.	LBTC 302	MOLECULAR BIOLOGY
4.	LBTC 402	BIOPHYSICAL TECHNIQUES
5.	LBTC 501	GENETIC ENGINEERING
6.	LBTC 503	BIOINFORMATICS
7.	LBTC 504	MEDICAL DIAGNOSTICS
8.	LBTC 505	BIOTECHNOLOGY IN CROP IMPROVEMENT
9.	LBTC 601	INDUSTRIAL BIOTECHNOLOGY
10.	LBTC 602	BIOSAFETY, BIOETHICS AND IPR
11.	LBTC 603	FERMENTATION TECHNOLOGY
12.	LBTC 704	RECOMBINANT DNA TECHNOLOGY
13.	LBTC 803	BIOTECHNIQUES
14.	LBTC 901	PLANT BIOTECHNOLOGY
15.	LBTC 902	MICROBIAL BIOTECHNOLOGY
16.	LBTC 903	ANIMAL BIOTECHNOLOGY
17.	LBTC 906	MOLECULAR DIAGNOSTICS
18.	LBTC 1001	BIOINFORMATICS AND BIostatISTICS
19.	LBTC 1002	PLANT METABOLIC ENGINEERING

गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)



Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur - 495009 (C.G.)

20.	LBTC 1003	GENE THERAPY AND NANOMEDICINE
21.	LBTC 1005	IMMUNOTECHNIQUES
22.	LBTC 1006	ENTREPRENURESHIP MANAGEMENT IN BIOTECHNOLOGY
23.	LBTC 1007	ENVIRONMENTAL BIOTECHNOLOGY
24.	LBTC 1008	DISSERTATION

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MINUTES OF THE MEETING OF BOARD OF STUDIES IN BIOTECHNOLOGY
HELD ON 13/04/2017

A Meeting of the BOS was held on 13/04/2017 at 12:00 Noon to discuss the following:

1. To discuss and approve the course structure and scheme of examination of Int. UG/PG, M.Sc. and Ph. D courses in Biotechnology and following members were present:

2. Any other matter by permission of the Chair.

(i) Dr. Renu Bhatt, Head	Chairman
(ii) Prof. B.N. Tiwary, Professor	Member
(iii) Prof. Ragini Gothwal,	Expert
(iv) Ms. Alka Ekka, Assistant Professor	Member

At the very outset the HOD and Chairman of BOS welcomed all the esteemed members and placed the draft prepared to revise course structure and scheme of examination in the light of UGC directives as per CBCS scheme to be implemented from 2017-18. The Syllabus of M.Sc Biotechnology and Pre Ph.D course work was also updated and placed before the committee.

The course structure and scheme of examination was discussed and approved by all the members.

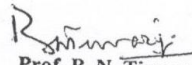
The chairman categorically pointed out that in the UG courses only 03 core subjects have to be defined and the student shall have to opt for honors subject in Ist semester only.

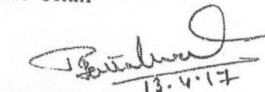
Group A: Biotechnology-Chemistry-Zoology

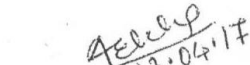
Group B: Biotechnology-Chemistry-Botany

The meeting ended with a vote of thanks by the Chair


Dr. Renu Bhatt
Chairman


Prof. B. N. Tiwary
Member


Prof. Ragini Gothwal
Expert


Ms. Alka Ekka
Member



Integrated UG/PG Biotechnology (Five years/Ten semesters)

Integrated UG/PG Semester - I					
Code	Course Opted	Subjects	Hours/ Semester	Hours/ Week	Credits
LBTC 101	Core-1	Paper-1 Biomolecules	32	2	2
LBTC 102		Paper-2 Cell Biology	32	2	2
	Core-2	Botany/ Zoology Paper-1	32	2	2
		Botany/ Zoology Paper-2	32	2	2
	Core-3	Chemistry Paper-1	32	2	2
		Chemistry Paper-2	32	2	2
	Ability Enhancement Compulsory Course				
		Hindi-I	32	2	2
		English-I	32	2	2
LBTC 103	Lab - 1	Laboratory - 1 (Based on Core - 1)	64	4	2
	Lab - 2	Laboratory - 2 (Based on Core - 2)	64	4	2
	Lab - 3	Laboratory - 3 (Based on Core - 3)	64	4	2
		Total	448	28	22

Integrated UG/PG Semester- II					
Code	Course Opted	Subjects	Hours/ Semester	Hours/ Week	Credits
LBTC 201	Core-1	Paper-1 Microbiology	32	2	2
LBTC 202		Paper-2 (Fundamental of Genetics)	32	2	2
	Core-2	Botany/ Zoology Paper-1	32	2	2
		Botany/ Zoology Paper-2	32	2	2
	Core-3	Chemistry Paper-1	32	2	2
		Chemistry Paper-2	32	2	2
	Ability Enhancement Compulsory Course				
		Hindi-II	32	2	2
		English-II	32	2	2
LBTC 203	Lab - 1	Laboratory - 1 (Based on Core - 1)	64	4	2
	Lab - 2	Laboratory - 2 (Based on Core - 2)	64	4	2
	Lab - 3	Laboratory - 3 (Based on Core - 3)	64	4	2
		Total	448	28	22



Integrated UG/PGSemester - III					
Code	Course Opted	Subjects	Hours/Semester	Hours/Week	Credits
LBTC 301	Core-1	Paper-1 Biostatistics	32	2	2
LBTC 302		Paper-2 Molecular Biology	32	2	2
	Core-2	Botany/ Zoology Paper-1	32	2	2
		Botany/ Zoology Paper-2	32	2	2
	Core-3	Chemistry Paper-1	32	2	2
		Chemistry Paper-2	32	2	2
	Skill Enhancement Course-1				
		Environmental Sciences-I	32	2	2
LBTC 303	Lab - 1	Laboratory - 1 (Based on Core - 1)	64	4	2
	Lab - 2	Laboratory - 2 (Based on Core - 2)	64	4	2
	Lab - 3	Laboratory - 3 (Based on Core - 3)	64	4	2
		Total	416	28	20

Integrated UG/PGSemester - IV					
Code	Course Opted	Subject	Hours/Semester	Hours/Week	Credits
LBTC 401	Core-1	Paper-1 Immunology	32	2	2
LBTC 402		Paper-2 Biophysical Techniques	32	2	2
	Core-2	Zoology/Botany Paper-1	32	2	2
		Zoology/Botany Paper-2	32	2	2
	Core-3	Chemistry Paper-1	32	2	2
		Chemistry Paper-2	32	2	2
	Skill Enhancement Course-1				
		Environmental Sciences-II	32	2	2
		Disaster Management (incorporate only if common syllabus or Academic council decision)	32	2	2
LBTC 403	Lab - 1	Laboratory - 1 (Based on Core - 1)	64	4	2
	Lab - 2	Laboratory - 2 (Based on Core - 2)	64	4	2
	Lab - 3	Laboratory - 3 (Based on Core - 3)	64	4	2
		Total	448	32	22

*Student can opt any one out of the three core papers (Biotechnology, Botany/Zoology and Chemistry) as the honours (Subject to the availability of the seats as approved by the Academic Council)

*The decision of the Dean of the school and the Head of the respective Department will be final



Integrated UG/PG V Semester					
Code	Course opted	Subjects	Hours/ semester	Hours/ week	Credits
LBTC 501	Core -1	Genetic Engineering	48	03	03
LBTC 502	Core -2	Animal & Plant biotechnology	48	03	03
LBTC 503	Core -3	Bioinformatics	48	03	03
LBTC 504 LBTC 505	Elective	a) Medical Diagnostics b) Biotechnology in Crop improvement	48	03	03
		Laboratory			
LBTC 506	Lab 01	Laboratory – 1 (based on Core -1 & Core -2)	96	06	03
LBTC 507	Lab 02	Laboratory - 2 (based on Core -3 & Elective)	96	06	03
LBTC 508	Seminar	Seminar based on elective	32	02	02
		Total	806	26	20



SEMESTER-II

Integ. UG/PG II Semester, Core- 1
Course: Microbiology
Course Code: LBTC 201
Course Credit: (2-0-0) 2

Unit - 1

History and scope of microbiology, aseptic techniques, bacterial and fungal staining, Microbial growth and nutrition: Different types of culture media, obtaining pure culture, measurement of bacterial growth

Unit - 2

General account and classification of virus, bacteriophage (lambda phage, T2, T4), general life cycle and lysogeny, abortive lysogeny, retrovirus, Φ X174, mycoplasma and prions

Unit - 3

General account and classification of bacteria, cell structure and reproduction, genetic recombination, economic importance of bacteria, Actinomycetes; general account

Unit - 4

General characters, classification of fungi with respect to asexual and sexual processes, economic importance of fungi

Unit - 5

Microbes in extreme environment: general characters, classification. Survival mechanism of thermophiles, halophiles, psychrophiles



SEMESTER-III

Integ. UG/PG III Semester, Core- 1
Course: Biostatistics
Course Code: LBTC 301
Course Credit: (2-0-0) 2

Unit - 1

Introduction and definition of biostatistics, tabulation and classification of data, frequency distribution and graphical distribution of data

Unit - 2

Measures of central tendencies, mean, median, mode and their properties, measure of dispersion: mean deviation, variance, coefficient of variance and standard deviation

Unit-3

Comparison of two data sets: hypothesis, students t-test, paired t-test, correlation coefficient, liner regression analysis, chi-square test, contingency test, testing of hypothesis

Unit - 4

Concepts and problems on probability: probability distribution function, binomial distribution, poisson distribution

Unit - 5

Comparison of three and more samples: one-way ANOVA test, least significant difference, two-way ANOVA test, hypothesis and testing of hypothesis

Evaluation Scheme:



Integ. UG/PG III Semester, Core- 1
Course: Molecular Biology
Course Code: LBTC 302
Course Credit: (2-0-0) 2

Unit - 1

Prokaryotic and eukaryotic genome organization, central dogma, structural organization of chromosome

Unit - 2

Basic rule for replication of nucleic acids, Mechanism of DNA replication in prokaryotes (Initiation, elongation and termination), Enzymology of DNA replication

Unit - 3

Basic features and mechanisms of RNA synthesis in prokaryotes, *E. coli* RNA polymerase, Concept of reverse transcription

Unit - 4

Genetic code, Translation machinery, Mechanism of protein synthesis-activation of amino acid and amino acylation of tRNA, initiation, elongation and termination,

Unit - 5

Molecular mechanism of gene regulation and transcriptional regulation in prokaryotes (Inducible and repressible system, positive regulation and negative regulation), Operon concept: lac, trp and ara operon



Integ. UG/PG IV Semester, Core - 1
Course: Biophysical Techniques
Course Code: LBTC 402
Course Credit: (2-0-0) 2

Unit - 1

General biophysical methods – Measurement of pH, buffers, Henderson – Hasselbalch equation, isoelectric point

Unit - 2

Separation & identification of biomolecules - concept of chromatography their types and applications, electrophoresis- types and application

Unit - 3

Centrifugation – Basic principle of centrifugation, types and application, instrumentation of ultracentrifuge and application

Unit - 4

Microscopy – light microscopy, bright & dark field microscopy, fluorescence microscopy, phase contrast microscopy, TEM, SEM

Unit - 5

Spectroscopy: Principle, types and instrumentation, (colorimeter, UV-Visible spectrophotometer, InfraRed spectrophotometer), Techniques of radioactivity and radioactive labeling, Counting- Scintillation counters, Geiger-Muller counter, autoradiography.



Integrated UG/PG V Sem, Core-1

Course: Genetic Engineering

Course Code: LBTC 501

Course Credit: (3-0-0) 3

Unit - 1

History of recombinant DNA technology, Host controlled restriction modification system, restriction endonucleases, Cutting and joining of DNA molecules *in vitro*. Phosphatases, ligases and polymerases

Unit - 2

Cloning vectors: plasmid, bacteriophage, cosmids, phagemid, BAC and YAC vectors, Expression vectors, Gene transfer methods: microinjection, electroporation, microprojectile bombardment, shot gun method, ultrasonication, lipofection, micro laser, Selection and screening of recombinants by genetic, immunochemical and hybridization methods

Unit - 3

Expression of foreign genes in *E.coli* and Yeast, application of gene cloning for the analysis of gene structure and function, expression of foreign genes using strong promoters, production of protein and other therapeutics from cloned genes, artificial insulin gene, recombinant vaccine

Unit - 4

Genetic engineering in plants: use of *Agrobacterium tumefaciens* and *Agrobacterium rhizogenes*, Ti plasmids, application of recombinant DNA technology in agriculture,

Unit - 5

Genetic engineering in animals: production of transgenic mice, embryonic stem cells for gene targeting in mice, applications of gene targeting



UG V Semester/ Integ. UG/PG V Semester, Core- 3
Course: Bioinformatics
Course Code: LBTC 503
Course Credit: (3-0-0) 3

Unit -1

Introduction to bioinformatics and data. Examples of related tools (FASTA, BLAST), databases (GENBANK, Pubmed, PDB). Applications of Bioinformatics.

Unit-2

General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum)

Unit-3

Data storage and retrieval and Interoperability Flat files, relational, object oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt). Introduction to Metadata and search;

Unit-4

Sequence Alignments and Visualization Introduction to Sequences; Local alignment and Global alignment, Pairwise alignment (BLAST and FASTA) and multiple sequence alignment (Clustal W).

Unit-5

Human genome and Genome Analysis, Whole genome analysis – shotgun sequencing, clone contig, Genome identification Feature based approach – ORF's; Primer Designing.

Evaluation Scheme:



Integrated UG/PG V Sem, Elective

Course: a) Medical Diagnostics
Course Code: LBTC 504
Course Credit: (3-0-0) 3

Unit-1

Introduction to medical diagnostics, methods of separation of molecule and cells, Methods of cell counting, Assays for estimation of biomolecules.

Unit-2

Analysis of body fluids, methods of body fluid collection, Process and investigation of basic hematology, blood transfusion, Blood banking, Urine analysis, Feces and sputum analysis,

Unit-3

Diagnostics methods for genetic disorders, chromosomal abnormalities: structural and numerical, karyotyping.

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Unit-4

Methods of diagnostic imaging: X-Ray, USG, CT, MRI, SPECT, targeted imaging.

Unit-5

Introduction to histopathology, preparation of histological slides and analysis, cytological investigations. Kit-based methods for diagnosis of hepatitis, blood Sugar Level etc.

Evaluation Scheme:



Integrated UG/PG V Sem, Elective

Course: b) Biotechnology in Crop improvement
Course Code: LBTC 505
Course Credit: (3-0-0) 3

Unit-1

Basic techniques and tools of plant tissue culture: Establishment of plant tissue culture lab: equipment, culture vessels, Composition of various tissue culture media and their preparation surface sterilization of various explants, pretreatment of explant, subculture and repeated transfer of explants and cultures, Hardening.

Unit-2

Culture techniques: Meristem tip culture, anther, embryo and ovule culture, callus culture, suspension cultures, Single cell culture, organogenesis and embryogenesis, Artificial seed (synthetic seed)

Unit-3

Tissue culture in crop improvement: Somaclonal variation, Somatic hybridization, Haploids in plant breeding Protoplast culture: Importance, Isolation of protoplasts, method of protoplast culture, culture media, Growth and division of protoplast, regeneration of plants, Production of virus-free plants

Unit-4

Transgenic plant: features of Ti and Ri plasmids, mechanisms of transformation, vectors and promoters, genetic markers, reporter genes, transformation, Herbicide and insect resistance transgenic plant, gene silencing

Unit-5

Biofertilizers, Plant growth promoting rhizobacteria, Biological control, Biopesticides- types and application, Integrated Pest Management (IPM)



Integrated UG/PG VI Sem, Core-1

Course: Industrial Biotechnology
Course Code: LBTC 601
Course Credit: (3-0-0) 3

Unit - 1

Bioreactor / Fermenter – types and working of Fermenters (Stirred tank, bubble columns, airlift. Bioreactors, Static, Submerged and agitated fermentation),

Unit - 2

Solid substratefermentation & submerged fermentations, Raw materials for fermentation, microbial Biomass production, principles of malt and brewing industry

Unit - 3

Enzyme technology – nature of enzymes, Industrial applications of enzyme, immobilized enzymes, limitations of microbial cells used as catalysts in fermentation, multi-enzyme reactors, protein engineering of enzymes

Unit - 4

Upstream processing (Strain selection, Sterilization), Downstream processing – extraction, separation, concentration, recovery & purification, operations of fermentation products.

Unit - 5

Production of recombinant proteins having, therapeutic and diagnostic applications, vaccines. Bioprocess strategies in Plant Cell and Animal Cell culture

Evaluation Scheme:



Course: Biosafety, IPR & Bioethics
Course Code: LBTC 602
Course Credit: (3-0-0) 3

Unit - 1

Biosafety: Good Lab Practices, Introduction to Biological Safety Cabinets, GMOs and LMOs and their environmental impact, Roles of Institutional Biosafety Committee, RCGM, GEAC etc. Hazardous Materials used in Biotechnology, their Handling and Disposal,

Unit- 2

Introduction to Intellectual Property: Concept of Intellectual Property Kinds of Intellectual Property Patents, Copyrights, Designs, Trademarks, Geographical Indication, Infringement of IPR, protection and Remedies, Licensing and its types

Unit-3

Introduction to the leading international instruments concerning intellectual property rights, The Berne Convention, GATT, WTO, Universal Copyright Convention, The Paris Convention, TRIPS, The World Intellectual Property Rights Organization (WIPO), Budapest treaty, Patent Infringement, Biological Patentability, Patenting Living Organisms,

Unit-4

Patents; Requirement of patentable novelty, Inventive step, Prior art Classifying products as patentable and non-patentable, Procedure for applying for patent, Indian Patent Act, Traditional Knowledge, Commercial Exploitation, and Protection, Biopiracy and Bioprospecting,

Unit-5

Introduction to Bioethics, Legal and Socio-economic impacts of Biotechnology, Ethical, Legal and Social Implications of Human Genome Project, Bioethics in Biodiversity, Resource Management and Genetically Modified Organisms



Integrated UG/PG VI Sem, Elective

Course: a) Fermentation Technology

Course Code: LBTC 603

Course Credit: (3-0-0) 3

Unit - 1

Introduction to fermentation: aerobic and anaerobic fermentations; Kinetics of growth and product formation - chemically structured models; mass transfer diffusion, membrane transport

Unit - 2

Fermenter design - operation, measurement and control in fermentation; Aeration and agitation in fermentation: Oxygen requirement, measurement of adsorption coefficients, bubble aeration, mechanical agitation, correlation between mass-transfer coefficient and operating variables, hollow fibre reactors, immobilized cell reactors

Unit - 3

Strain development: General aspects mutation selection of mutants, recombination, regulation gene technology and use of genetic methods, In brief genetic engineering for strain improvements and applications in medicine, agriculture and industry

Unit - 4

Microbial Biotransformation: types, methods and processes, analysis and isolation of products, applications in waste management, medicine and agriculture; Biogas production - pathways, regulation/modulation, advanced biomethanation systems and their applications

Unit - 5

Microbial & Bioprocess technology: Down stream processing in brief -Methods for vitamins (B₁₂& Riboflavin), amino acids (L-glutamic acid & L Lysine), organic acids (Citric acid &Gluconic acid), enzymes (Amylases & pectinases), antibiotics (Beta Lactam antibiotics & amino acid and peptide antibiotics), microbes as biocontrol agents